**AMENDMENTS TO THE CLAIMS:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. **(currently amended)** An apparatus for online signature verification using ~~analyzing~~ a reference signature database (DB) ~~of a specific user~~, the apparatus comprising:

a signature data input unit for digitalizing a locus of a user's input signature and reading the digitized locus as a signature sequence of sample points sampled at regular time intervals;

a first pattern transform unit for performing a speed equalization on the signature sequence read by the signature data input unit and generating a first transformed pattern sequence, wherein said speed equalization is based on the assumption that linear velocities at the sample points on the locus are equal to a constant value;

a second pattern transform unit for performing a velocity transformation on the signature sequence read by the signature data input unit and generating a second transformed pattern sequence;

a feature extraction unit for extracting a characteristics vector ~~three feature vectors~~ from the signature sequence ~~read by the signature data input unit~~, the first transformed pattern sequence ~~transformed by the first pattern transform unit~~ and the second transformed pattern sequence ~~transformed by the second pattern transform unit, respectively, to thereby generate the three feature vectors having different information~~;

a difference vector estimation unit for generating a difference vector between [[the]] a feature vector of the ~~specific~~ user's reference signature read from the reference signature DB and the characteristics ~~feature~~ vector extracted by the feature extraction unit; and

a determination unit for determining whether **[[**an**]]** the input signature and the reference signature are signed by the same ~~a single~~ person or not, based on the difference vector generated from the difference vector estimation unit.

2. **(currently amended)** The apparatus of claim 1, wherein ~~the first pattern transform unit transforms the signature sequence read by the signature data input unit and generates the first transformed pattern sequence,~~ the speed equalization is ~~transform being~~ performed by using **[[**a**]]** the following equation:

~~(Equation)~~

$s_i = p_i$ $\quad i = 1, 2$

$s_i = s_{i-1} + (p_i - p_{i-1})$ $\quad i = N-1, N$

$s_i = s_{i-1} + v\Delta t \bullet \Theta$ $\quad$ otherwise

wherein ~~$p_i$, $s_i$, v, $\Delta t$, and $\Theta$ represent a point on an input signature pattern locus, $s_i$ is an element of a transformed two-dimensional vector list, a velocity, a time interval between sample points, and a unit vector in the direction of $\theta$, i.e., in the locus at the point $p_i$, respectively~~

$p_i$ represents the $i^{th}$ sample point on the signature sequence of the digitized locus,

$s_i$ represents the corresponding $i^{th}$ element of the first transformed pattern sequence,

v represents the constant velocity,

$\Delta t$ represents the sampling time interval between the sample points on the signature sequence, and

$\Theta$ represents a unit vector in the direction $\theta$ of the digitized locus at the sample point $p_i$.

3. **(currently amended)** The apparatus of claim 1, wherein ~~the second pattern transform unit transforms the signature sequence read by the signature data input unit and generates the second transformed pattern sequence,~~ the velocity transformation is **[[**being**]]** performed by using **[[**a**]]** the following equation:

~~(Equation)~~

$v_i = v_3$ $\quad i = 1, 2$

$v_i = v_{N-2}$ $\quad i = N-1, N$

$v_i = (v_{xi}, v_{yi})$ otherwise

wherein [[the]]

$v_i$ is the $i^{th}$ element of the second transformed pattern sequence ~~an element of the transformed two-dimensional vector list~~, and

$v_{xi}$ and $v_{yi}$ are first horizontal and vertical derivatives at the corresponding sample point $p_i$ on the digitized ~~input signature pattern~~ locus.

4. **(currently amended)** The apparatus of claim 1, wherein the speed equalization is a technique for recomposing a signature pattern based on an inverse proportional relation between a signature speed and a length of the pattern, and the velocity transformation is a technique for transforming a spatial pattern into a velocity domain.

5. **(currently amended)** An ~~method for~~ online signature verification method using ~~analyzing~~ a reference signature DB ~~of a specific user~~, the method comprising the steps of:

(a) digitalizing a locus of a user's input signature and reading the digitized locus as a signature sequence of sample points sampled at regular time intervals;

(b) performing a speed equalization on the signature sequence read in the step (a) to generate a first transformed pattern sequence, wherein said speed equalization is based on the assumption that linear velocities at the sample points on the locus are equal to a constant value;

(c) performing a velocity transformation on the signature sequence read in the step (a) to generate a second transformed pattern sequence;

(d) extracting a characteristics vector ~~three characteristics vectors~~ from the signature sequence read in the step (a), the first transformed pattern sequence generated ~~transformed~~ in the step (b) and the second transformed pattern sequence generated ~~transformed~~ in the step (c), ~~respectively, to thereby generate three characteristics vectors having different information~~;

(e) generating a difference vector between a feature ~~the characteristics~~ vector of the ~~specific~~ user's reference signature read from the reference signature DB and the characteristics vector extracted in the step (d); and

(f) determining whether **[[**an**]]** the input signature and the reference signature are signed by the same ~~a single~~ person or not, based on the difference vector generated in the step (e).

6. **(new)** The method of claim 5, wherein the speed equalization is performed by using the following equation:

$s_i = p_i$ i = 1, 2

$s_i = s_{i-1} + (p_i - p_{i-1})$ i = N-1, N

$s_i = s_{i-1} + v\Delta t \bullet \Theta$ otherwise

wherein

$p_i$ represents the $i^{th}$ sample point on the signature sequence of the digitized locus,

$s_i$ represents the corresponding $i^{th}$ element of the first transformed pattern sequence,

v represents the constant velocity,

$\Delta t$ represents the sampling time interval between the sample points on the signature sequence, and

$\Theta$ represents a unit vector in the direction $\theta$ of the digitized locus at the sample point $p_i$.

7. **(new)** The method of claim 5, wherein the velocity transformation is performed by using the following equation:

$v_i = v_3$ i = 1, 2

$v_i = v_{N-2}$ i = N-1, N

$v_i = (v_{xi}, v_{yi})$ otherwise

wherein

$v_i$ is the $i^{th}$ element of the second transformed pattern sequence , and

$v_{xi}$ and $v_{yi}$ are first horizontal and vertical derivatives at the corresponding sample point $p_i$

on the digitized locus.

8. **(new)** The method of claim 5, wherein the speed equalization is a technique for recomposing a signature pattern based on an inverse proportional relation between a signature speed and a length of the pattern, and the velocity transformation is a technique for transforming a spatial pattern into a velocity domain.

9. **(new)** The method of claim 6, wherein the direction $\theta$ of the digitized locus at the sample point $p_i$ is determined by the following equation:

$$\theta = \arctan(v_{yi}/v_{xi})$$

wherein

$v_{xi}$ and $v_{yi}$ are first horizontal and vertical derivatives at the sample point $p_i$.

10. **(new)** The method of claim 9, wherein the velocity transformation is performed by using the following equation:

$$v_i = v_3 \qquad i = 1, 2$$

$$v_i = v_{N-2} \qquad i = N-1, N$$

$$v_i = (v_{xi}, v_{yi}) \qquad \text{otherwise}$$

wherein

$v_i$ is the $i^{th}$ element of the second transformed pattern sequence.

11. **(new)** The method of claim 10, wherein the first horizontal and vertical derivatives at the sample point $p_i$ are determined by the following equations:

$$v_{xi} = (-p_{i+2}(x) + 8p_{i+1}(x) - 8p_{i-1}(x) + p_{i-2}(x))/12$$

$$v_{yi} = (-p_{i+2}(y) + 8p_{i+1}(y) - 8p_{i-1}(y) + p_{i-2}(y))/12.$$

12. **(new)** The method of claim 5, wherein the sample points are distributed according

to a radial histogram which comprises bins successively arranged around the origin of a Cartesian coordinate system, and wherein the distribution is based on locations where the locus passes.

13. **(new)** The apparatus of claim 2, wherein the direction $\theta$ of the digitized locus at the sample point $p_i$ is determined by the following equation:

$$\theta = \arctan(v_{yi}/v_{xi})$$

wherein

$v_{xi}$ and $v_{yi}$ are first horizontal and vertical derivatives at the sample point $p_i$.

14. **(new)** The apparatus of claim 13, wherein the velocity transformation is performed by using the following equation:

$v_i = v_3$ $\quad i = 1, 2$

$v_i = v_{N-2}$ $\quad i = N-1, N$

$v_i = (v_{xi}, v_{yi})$ $\quad$ otherwise

wherein

$v_i$ is the $i^{th}$ element of the second transformed pattern sequence.

15. **(new)** The apparatus of claim 14, wherein the first horizontal and vertical derivatives at the sample point $p_i$ are determined by the following equations:

$$v_{xi} = (-p_{i+2}(x) + 8p_{i+1}(x) - 8p_{i-1}(x) + p_{i-2}(x))/12$$

$$v_{yi} = (-p_{i+2}(y) + 8p_{i+1}(y) - 8p_{i-1}(y) + p_{i-2}(y))/12.$$

16. **(new)** The apparatus of claim 1, wherein the sample points are distributed according to a radial histogram which comprises bins successively arranged around the origin of a Cartesian coordinate system, and wherein the distribution is based on locations where the locus passes.